

Course: MFM2P Gr. 10 AppliedLesson: 6-3Unit: Quadratic RelationsTopic: Modelling Quadratic Relations

✚ *homework check:* Lesson 6 - 2

✚ *note:* Modelling Quadratic Relations

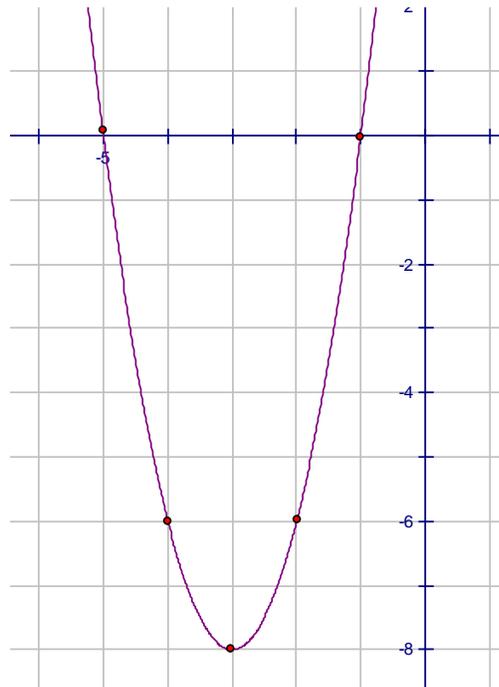
There are subtle differences between linear and quadratic relations when we look at their equations. A linear equation has the form $y = mx + b$ while a quadratic relation has the form $y = ax^2 + bx + c$. Notice the exponent 2 in the quadratic relation: all quadratic relations must have an x^2 term.

Because a quadratic shape increases to a maximum or decreases to a minimum, the value of 'a' tells us the direction of opening. If the coefficient of x^2 is positive, the parabola opens up creating a minimum point at the bottom of the curve. If the coefficient of x^2 is negative, the parabola opens down creating a maximum point at the top of the curve.

The vertex of the parabola is another name for either the maximum or minimum point. The vertex is the point where the direction of the parabola changes. The actual maximum or minimum value is the y – coordinate of the vertex. The axis of symmetry is the x – coordinate value of the vertex.

Since a parabola can be graphed on the coordinate axis, the curve tends to cross both the x and y axes. The place where the graph crosses the x axis is called the x – intercept. The place where the graph crosses the y axis is called the y – intercept. For example, identify the vertex, the axis of symmetry, and the minimum or maximum value in each of the following.

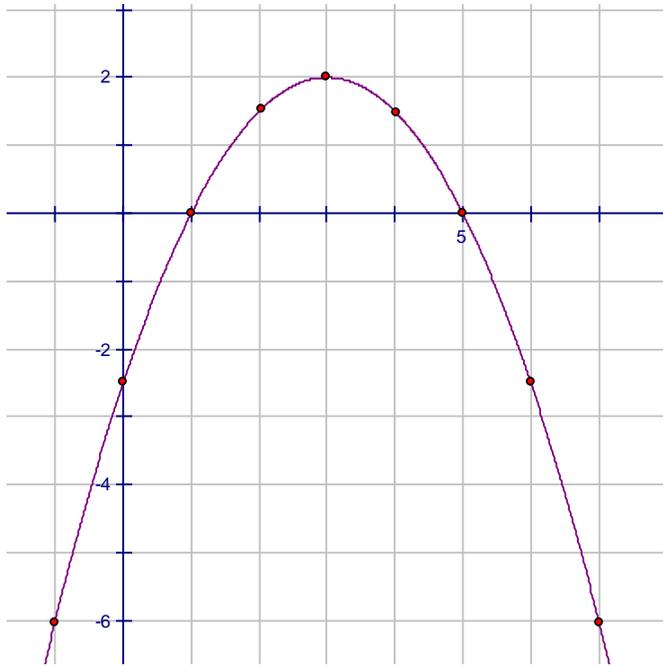
a)

vertex: $(-3, -8)$ x-intercepts: $(-5, 0)(-1, 0)$

y-intercept: cannot be determined

min/max value: min at -8 axis of symmetry: $x = -3$

b)

vertex: $(3, 2)$ x-intercepts: $(1, 0)(5, 0)$ y-intercept: $(0, -2.5)$

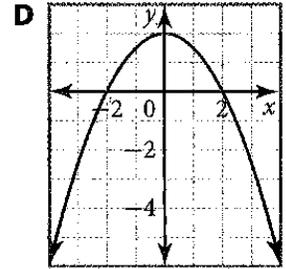
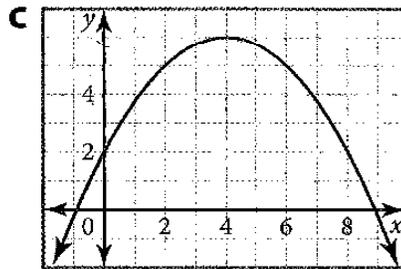
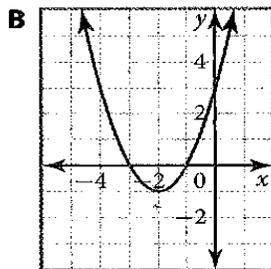
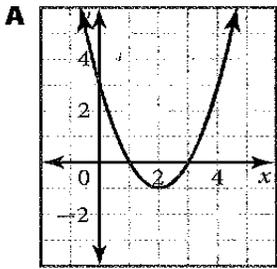
min/max value: max at 2

axis of symmetry: $x = 3$ **✚ homework assignment: Lesson 6 - 3**

Lesson 6 – 3: Modelling Quadratic Relations

Mark (/45): _____

1. Complete the chart given the following graphs. (20 marks)



Graph	Vertex	Axis of Symmetry	Y-Intercept	Max/Min value	X-Intercepts
A					
B					
C					
D					

2. A solar oven reflects the sun's rays using the equation $y = -2x^2 - 4x - 3$. (10 marks)

x	$y = -2x^2 - 4x - 3$
-3	
-2	
-1	
0	
1	
2	

a) Complete the table.

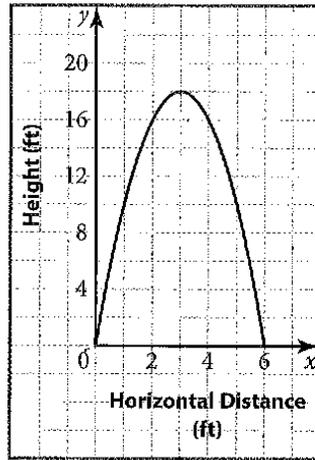
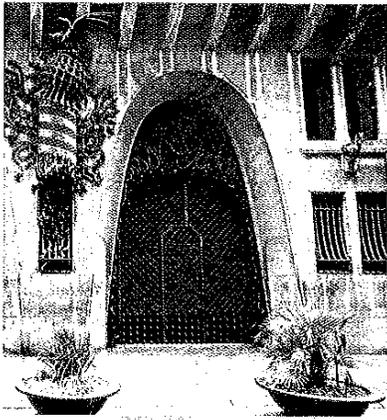
b) Identify the coordinates of the vertex.

c) Write the equation of the axis of symmetry.

d) What is the y-intercept?

e) What is the max/min value?

3. Parabolas can appear in architecture in the forms of bridges and arches. In each case, a graph can be overlaid and information can be found. The graph shown models the doorway in the picture. (5 marks)



a) What does the vertex tell you about the doorway?

b) What do the x-intercepts tell you about the doorway?

c) Why is an arch structure used as a doorway?

4. The equation $h = -0.0159d^2 + 290$ represents an arched stone over a river in Utah.

a) Complete the table and graph the relation on the grid provided. (10 marks)



b) What are the coordinates of the vertex?

c) What does the x-coordinate in the vertex mean about the arched stone?

x (m)	$h = -0.0159d^2 + 290$ (m)
-25	
0	
25	
50	
75	
100	

d) Common factor the equation to find the x-intercepts.

e) How wide is the arched stone?